(c) N_2O and CH_4 emissions from fuel combustion at each lime kiln. You must report these emissions under 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources).

(d) CO_2, N_2O, and CH_4 emissions from each stationary fuel combustion unit other than lime kilns. You must report these emissions under 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources).

(e) CO_2 collected and transferred off site under 40 CFR part 98, following the requirements of subpart PP of this part (Suppliers of Carbon Dioxide (CO_2)).

§ 98.193 Calculating GHG emissions.

You must calculate and report the annual process CO_2 emissions from all lime kilns combined using the procedure in paragraphs (a) and (b) of this section.

(a) If all lime kilns meet the conditions specified in §98.33(b)(4)(ii) or (b)(4)(iii), you must calculate and report under this subpart the combined process and combustion CO_2 emissions by operating and maintaining a CEMS to measure CO_2 emissions according to the Tier 4 Calculation Methodology specified in §98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

(b) If CEMS are not required to be used to determine CO_2 emissions from all lime kilns under paragraph (a) of this section, then you must calculate and report the process and combustion CO_2 emissions from the lime kilns by using the procedures in either paragraph (b)(1) or (b)(2) of this section.

(1) Calculate and report under this subpart the combined process and combustion CO_2 emissions by operating and maintaining a CEMS to measure CO_2 emissions from all lime kilns according to the Tier 4 Calculation Methodology specified in §98.33(a)(4) and all associated requirements for Tier 4 in subpart C of this part (General Stationary Fuel Combustion Sources).

(2) Calculate and report process and combustion CO_2 emissions separately using the procedures specified in paragraphs (b)(2)(i) through (b)(2)(v) of this section.

(i) You must calculate a monthly emission factor for each type of lime produced using Equation S–1 of this section. Calcium oxide and magnesium oxide content must be analyzed monthly for each lime type:

$$EF_{LIME,i,n} = \left[\left(SR_{CaO} * CaO_{i,n}\right) + \left(SR_{MgO} * MgO_{i,n}\right)\right] * \frac{2000}{2205} \qquad \text{(Eq. S-1)}$$

Where:

$EF_{LIME,i,n}$ = Emission factor for lime type i, for month n (metric tons CO_2/ton lime).

SR_{CaO} = Stoichiometric ratio of CO_2 and CaO for calcium carbonate [see Table S–1 of this subpart] (metric tons CO_2/metric tons CaO).

SR_{MgO} = Stoichiometric ratio of CO_2 and MgO for magnesium carbonate (See Table S–1 of this subpart) (metric tons CO_2/metric tons MgO).

$CaO_{i,n}$ = Calcium oxide content for lime type i, for month n, determined according to §98.194(c) (metric tons CaO/metric ton lime).

$MgO_{i,n}$ = Magnesium oxide content for lime type i, for month n, determined according to §98.194(c) (metric tons MgO/metric ton lime).

2000/2205 = Conversion factor for metric tons to tons.

(ii) You must calculate a monthly emission factor for each type of by-product/waste sold (including lime kiln dust) using Equation S–2 of this section:

$$EF_{LKD,i,n} = \left[\left(SR_{CaO} * CaO_{LKD,i,n}\right) + \left(SR_{MgO} * MgO_{LKD,i,n}\right)\right] * \frac{2000}{2205} \qquad \text{(Eq. S-2)}$$

Where:

$EF_{LKD,i,n}$ = Emission factor for sold lime byproduct/waste type i, for month n (metric tons CO_2/ton lime byproduct).

SR_{CaO} = Stoichiometric ratio of CO_2 and CaO for calcium carbonate (see Table S–1 of this subpart((metric tons CO_2/metric tons CaO).

SR_{MgO} = Stoichiometric ratio of CO_2 and MgO for magnesium carbonate (See Table S–1 of this subpart) (metric tons CO_2/metric tons MgO).

$CaO_{LKD,i,n}$ = Calcium oxide content for sold lime byproduct/waste type i, for month n (metric tons CaO/metric ton lime).

$MgO_{LKD,i,n}$ = Magnesium oxide content for sold lime byproduct/waste type i, for month n (metric tons MgO/metric ton lime).

2000/2205 = Conversion factor for metric tons to tons.

(iii) You must calculate the annual CO_2 emissions from each type of byproduct/waste that is not sold (including lime kiln dust and scrubber sludge) using Equation S–3 of this section:

$$E_{waste,i} = \left[\left(SR_{CaO} * CaO_{waste,i}\right) + \left(SR_{MgO} * MgO_{waste,i}\right)\right] * M_{waste,i} * \frac{2000}{2205} \qquad \text{(Eq. S-3)}$$

Where:

$E_{waste,i}$ = Annual CO_2 emissions for unsold lime byproduct/waste type i (metric tons CO_2).

SR_{CaO} = Stoichiometric ratio of CO_2 and CaO for calcium carbonate (see Table S–1 of this subpart) (metric tons CO_2/metric tons CaO).

SR_{MgO} = Stoichiometric ratio of CO_2 and MgO for magnesium carbonate (See Table S–1 of this subpart) (metric tons CO_2/metric tons MgO).

$CaO_{waste,i}$ = Calcium oxide content for unsold lime byproduct/waste type i (metric tons CaO/metric ton lime).

$MgO_{waste,i}$ = Magnesium oxide content for unsold lime byproduct/waste type i (metric tons MgO/metric ton lime).

$M_{waste,i}$ = Annual weight or mass of unsold byproducts/wastes for lime type i (tons).

2000/2205 = Conversion factor for metric tons to tons.

(iv) You must calculate annual CO_2 process emissions for all kilns using Equation S–4 of this section:

$$E_{CO_2} \sum_{i=1}^{t} \sum_{n=1}^{12} \left(EF_{LIME,i,n} * M_{LIME,i,n}\right) + \sum_{i=1}^{b} \sum_{n=1}^{12} EF_{LKD,i,n} * M_{LKD,i,n}) + \sum_{i=1}^{z} E_{waste,i} \qquad \text{(Eq. S-4)}$$

Where:

E_{CO2} = Annual CO_2 process emissions from lime production from all kilns (metric tons/year).

$EF_{LIME,i,n}$ = Emission factor for lime type i, in calendar month n (metric tons CO_2/ton lime) from Equation S–1 of this section.

$M_{LIME,i,n}$ = Weight or mass of lime type i in calendar month n (tons).

$EF_{LKD,i,n}$ = Emission factor of byproducts/wastes sold for lime type i in calendar month n, (metric tons CO_2/ton byproduct/waste) from Equation S–2 of this section.

$M_{LKD,i,n}$ = Monthly weight or mass of byproducts/waste sold (such as lime kiln dust, LKD) for lime type i in calendar month n (tons).

$E_{waste,i}$ = Annual CO_2 emissions for unsold lime byproduct/waste type i (metric tons CO_2) from Equation S–3 of this section.

t = Number of lime types

b = Number of byproducts/wastes sold

z = Number of byproducts/wastes not sold

(v) Calculate and report under subpart C of this part (General Stationary Fuel Combustion Sources) the combustion CO_2 emissions from each lime kiln according to the applicable requirements in subpart C.

§ 98.194 Monitoring and QA/QC requirements.

(a) You must determine the total quantity of each product type of lime and each calcined byproduct/waste (such as lime kiln dust) that is sold. The quantities of each should be directly measured monthly with the